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IS 11359 (1985): Wax Candles [MED 26: Oil Burning Appliances]



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IS : 11359 - 1985

Indian Standard

REAFFIRMED

SPECIFICATION FOR
WAX CANDLES

UDC 665'17 : 628'9'045



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NEW DELHI 110002

Indian Standard

SPECIFICATION FOR WAX CANDLES

Oil Burning Appliances (Non-Pressure Type) Sectional Committee, CPDC 2

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AMENDMENT NO. 1 JULY 1988

TO

IS:11359-1985 SPECIFICATION FOR WAX CANDLES

(Page 3, clause 3.1) - Substitute the following for the existing clause:

'3.1 The candles shall be solid and made from paraffin wax conforming to type 2 and type 3 (with minimum melting point of 58°C) as specified in IS:4654-1974*.'

(CPDC 3)

Reprography Unit, BIS, New Delhi, India

Indian Standard

SPECIFICATION FOR WAX CANDLES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 1 March 1985, after the draft finalized by the Oil Burning Appliances (Non-Pressure Type) Sectional Committee had been approved by the Consumer Products and Medical Instruments Division Council.

0.2 The requirements laid down in this Indian Standard are based on the experiments conducted at the Indian Institute of Petroleum, Dehra Dun. Considerable assistance has also been derived from the following specifications:

C-C-91d Candle, Illuminating, Federal Specification, USA.

UNIT-17-1-1D Candle, Illuminating, Department of National Defence, Directorate of Inter-Service Development, Canada.

Ceylon Standard 189 : 1973 Specification for Illuminating Paraffin Wax Candles, Bureau of Ceylon Standards, Ceylon.

SI 207 Paraffin Wax Candles, The Standards Institution of Israel.

IND/SL/7137 Candle Wax-Non-Drip Type, Ministry of Defence, India.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified values in this standard.

1. SCOPE

1.1 This standard prescribes requirements of wax candles for use for illuminating purposes (excluding ornamental candles).

*Rules for rounding off numerical values (revised).

2. DIMENSIONS

2.1 The candles shall be made in the following two sizes:

Size	Diameter	Length
(1)	(2)	(3)
	mm	mm
1	10 ± 0.5	150 ± 5.0
2	20 ± 1.0	220 ± 5.0

3. MATERIAL

3.1 The candles shall be solid and made from paraffin wax conforming to any of the type specified in IS : 4654-1974*.

3.1.1 A suitable additives for bringing the performance up to specified limit shall be permitted.

3.2 The wicks used in the candle shall be made of fine cotton thread free from cotton seed skin and kinks. They shall be properly pickled for 24 hours in a non-poisonous mineral salt and shall be centrifuged and dried before use.

4. WORKMANSHIP AND FINISH

4.1 The candle shall be clean, free from dirt and foreign matter, uniform, free of fractures (breaks) and distortions (wraped, sags, runs, two or more fused together) and free from trapped air bubbles. It shall be straight, cylindrical with a properly finished shoulder and a completely flat base without recess. The wick shall be properly centred and shall not be visible along the shaft of the candle. The wick shall be visible on the bottom of the candle and shall extend the entire length of the candle and at least 6 mm beyond the tip. The candle shall be uniformly white in colour. The finished product shall be free from unpleasant odour (pungent and unsavoury) during burning and non-burning. The flame shall be non-smoking and non-sputtering.

5. PERFORMANCE

5.1 Mean horizontal luminous intensity (MHLI) in candles, luminous efficiency (LE) cd/g/hr, duration of burning, breaking stress, drip, smoking and bending tendency shall be as given in Table 1 when the candles are tested as per the Appendices given in the last col of the Table 1.

*Specification for paraffin wax (*first revision*)

TABLE 1 PERFORMANCE AND REQUIREMENTS OF WAX CANDLES
(Clause 5.1)

PERFORMANCE	REQUIREMENTS		TEST METHOD Ref to Appendix
	Size No. 1	Size No. 2	
(1)	(2)	(3)	(4)
Mean horizontal luminous intensity, Cd, <i>Min</i>	0.75	1.5	A
Lighting efficiency, cd/g/h, <i>Min</i>	0.15	0.15	A
Duration of complete burning, h, <i>Min</i>	1.5	5	—
Drip	Nil	Nil	—
Smoking	Absent	Absent	—
Breaking stress, kN/m ²	1 500	1 500	B
Bending tendency	Nil	Nil	5.2
Deflection, angular degrees, <i>Max</i>	3°	3°	C

5.2 Bending tendency of the candle shall be determined by suspending the candle horizontally with one end fixed and kept, in an air oven at 40°C for 24 hours with periodic observations for possible failure.

6. BURNING QUALITY

6.1 The candles shall burn uniformly with an even flame. The flame shall consume the candle and wick without dripping, excessive smoking, objectionable odour, and without the necessity of trimming wick.

6.2 The burning time of the candle shall be determined at an ambient temperature of $29 \pm 2^\circ\text{C}$ under conditions free from draughts but with access to air.

7. MARKING

7.1 Each packet shall be clearly and indelibly marked with the manufacturer's address, name, initial or recognized trade-mark and also with the number of candles when packed.

8. PACKING

8.1 Each packet shall contain the number of candles as agreed to between the purchasers and the suppliers.

8.1.1 The packaging material shall be suitable for providing protection to candles against damage during transportation.

9. SAMPLING PLAN AND CRITERIA FOR CONFORMITY

9.1 Subject to agreement between the purchaser and the supplier, a sampling scheme and criteria for conformity may be adopted as given in Appendix D.

APPENDIX A

(Clause 5.1)

METHOD FOR MEASUREMENT OF MEAN HORIZONTAL LUMINOUS INTENSITY (MHLI)

A-1. CONVENTIONAL METHOD

A-1.1 Photometric Equipment

A-1.1.1 The Mean Horizontal Luminous Intensity (MHLI) of the burning candles shall be measured against a metal filament, sub-standard electric lamp mounted on a sub-standard photometer bench, with suitable form of photometer head.

A-1.2 Procedure for Measuring MHLI

A-1.2.1 Mount the test, candle on a candle stand straight, placed on a table fixed on one of the carriages of the photometer bench (see Fig. 2). The candle shall be lighted and kept burning free from draught for 10 minutes. It shall be then extinguished and weighed with candle stand (see Fig. 1). The candle shall be relighted and kept burning for 5 minutes to attain steady state condition, free from draughts. The middle portion of the flame, photometer head and sub-standard electric lamp shall be in the same horizontal plane and photometer head shall be placed perpendicular to the incident light from the flame. The sub-standard lamp and the photometer head shall be kept at any convenient position on the bench.

A-1.2.2 The burning candle shall be moved to and fro on one side of the photometer head until the position of balance is reached. Measurement shall be made in a horizontal plane by changing the position of the candle in four directions at right angles to the axis of the candle differing by 90°. A number of readings in each direction shall be taken and the average of all these measurements in four directions shall be the mean horizontal luminous intensity (MHLI). Duration of complete burning, smoking tendency of flame (see Fig. 4) in the initial burning for 10 min and dripping, if any, shall also be observed.

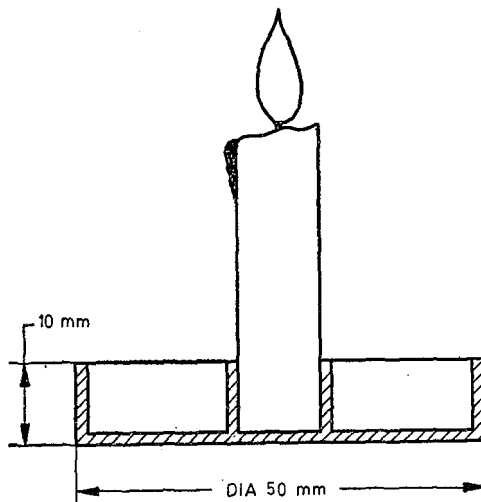


FIG. 1. CANDLE STAND

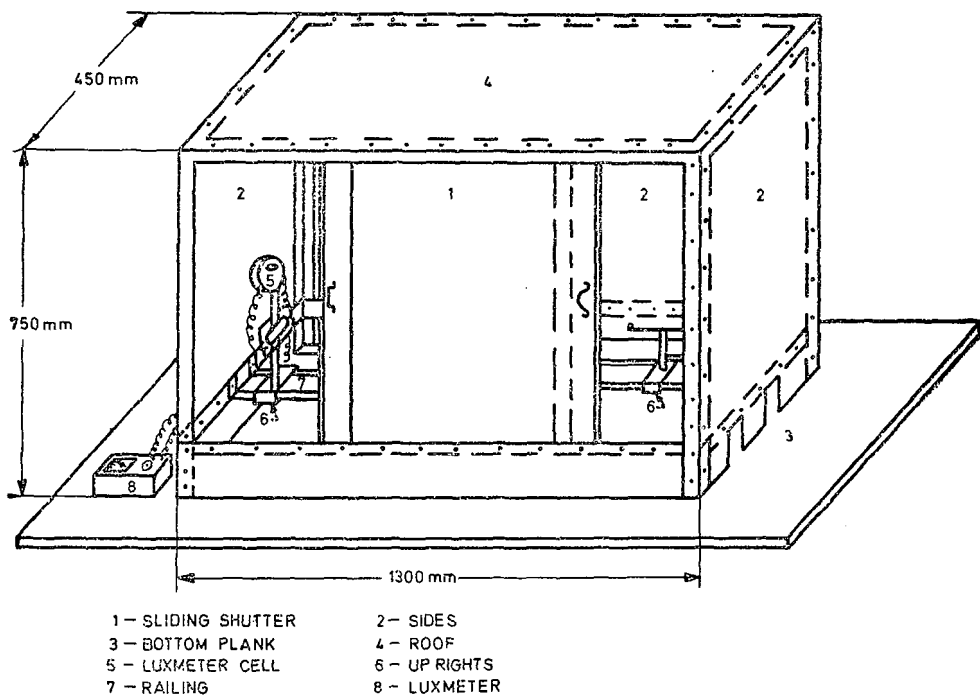


FIG. 2 ENCLOSURE FOR MEASUREMENT OF MEAN HORIZONTAL LUMINOUS INTENSITY

A-2. ALTERNATE METHOD

A-2.1 Luxmeter and Other Equipments

A-2.1.1 The measurement of MHLI and burning rate of the candle shall be done, in a wooden enclosure, having dimensions of $300 \times 450 \times 750$ mm (*see* Fig. 2) painted black from inside with dull black paint after placing the candle on a candle stand (*see* Fig. 1). The wooden enclosure shall consist of following:

- a) Luxmeter;
- b) Optical bench;
- c) Two uprights, which can be slid over the bench; and
- d) A rotatable metallic disc mounted on the upright for placing the candle with candle stand.

The enclosure may have a sliding door in the front. The top may be made into two halves, fixed with hinges, so that one half may be lifted off when measurements are not being made, while candle is still burning inside the enclosure.

Suitable openings may be provided at the bottom of the enclosure for entry of fresh air.

A-2.1.2 Procedure — To carry out the test, the candle shall be mounted straight on a candle stand (*see* Fig. 1) placed on a table fixed on one of the carriages of the photometer bench. The candle shall be lighted in the enclosure free from draft and kept burning for 10 min. It shall be the extinguished and weighed with candle stand.

The candle shall be relighted and kept burning for 5 min to attain a steady state condition, in the enclosure. The distance between the flame and photometric cell shall be adjusted to 100 cm or any convenient distance. The flame and photometric cell shall be in the same horizontal plane and maximum incident light from the flame shall fall on the cell.

A-2.1.3 Measurements of lux shall be made in four directions by rotating the metallic disc on which the candle is placed, differing by an angle of 90° . Average of the four readings shall be taken. Such readings shall be taken after every 15 min (that is after 15 min, 30 min, 45 min and 1 hour). Average of these readings shall be taken. After one hour of re-lighting, the candle shall be extinguished and weighed with the candle stand.

Difference between the first and second mass will give consumption of wax in g/h.

During the test, if any abnormality occurs, such as flame disturbed by draft or any mishandling of the candle, the whole test shall be repeated. Duration of complete burning smoking tendency of flame (see Fig. 3) in the initial burning for 10 min and dripping if any shall also be observed.

A-2.1.4 Calculations — Mean horizontal luminous intensity (MHLI) and lighting efficiency (LE) shall be calculated as follows:

Mean horizontal luminous intensity (MHLI) (cd/g/h) = $\text{lux} \times (\text{Distance in meters})^2$

$$\text{Lighting efficiency, (cd/g/h)} = \frac{\text{Mean horizontal luminous intensity (MHLI) (cd)}}{\text{Wax consumption (g/h)}}$$

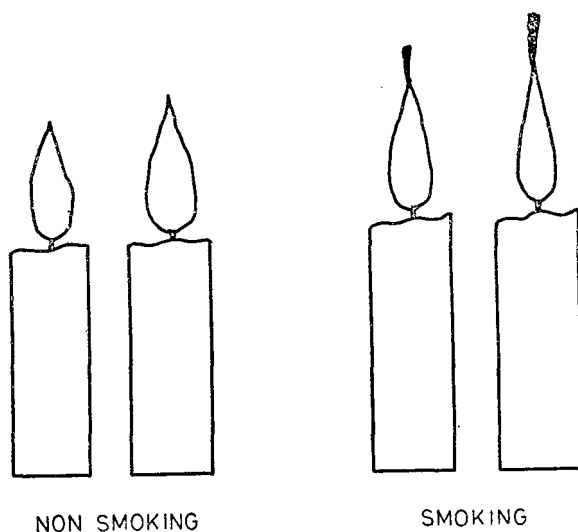


FIG. 3 SMOKING TENDENCY OF CANDLES

APPENDIX B

(Clause 5.1)

METHOD FOR MEASUREMENT OF BREAKING STRESS OF CANDLE

B-1. APPARATUS

B-1.1 The breaking stress of the candle shall be determined with the help of a test rig as shown in Fig. 4.

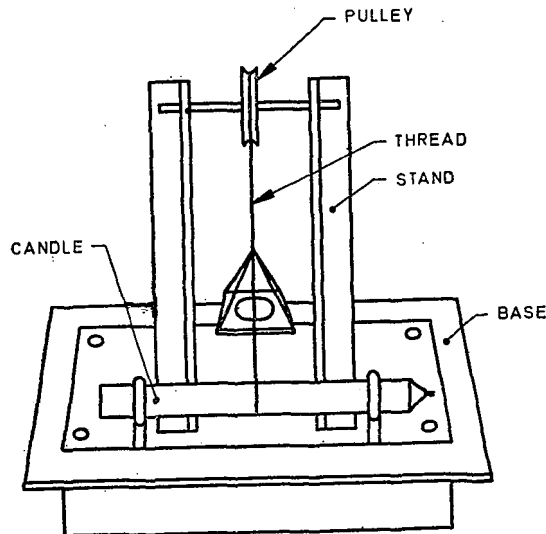


FIG. 4 APPARATUS FOR MEASUREMENT OF BREAKING STRESS

B-2. PROCEDURE

B-2.1 The candle is supported at two ends and tied at the middle with a thread passing over a pulley and attached to a pan for applying load. The mass in the pan shall be added gradually. The load at which the candle shall break from the centre is noted.

B-3. CALCULATIONS

B-3.1 The breaking stress can be calculated as given below:

$$\text{Breaking stress, kN/m}^2 = \frac{80 g WL}{D^2}$$

where

W = force applied, N;

L = distance between the supporting ends, m; and

D = diameter of the candle, m.

APPENDIX C

(Clause 5.1)

METHOD OF TEST FOR DEFLECTION

C-1. APPARATUS

C-1.1 Deflection Tester — The deflection tester shall consist of an accurate protractor chart marked off at each 10 degrees, with the first 10 degrees subdivided into 10 equal parts. A suitable clamp arrangement shall be used to hold candle and protractor chart (*see* Fig. 5). The protractor chart shall be in a vertical position.

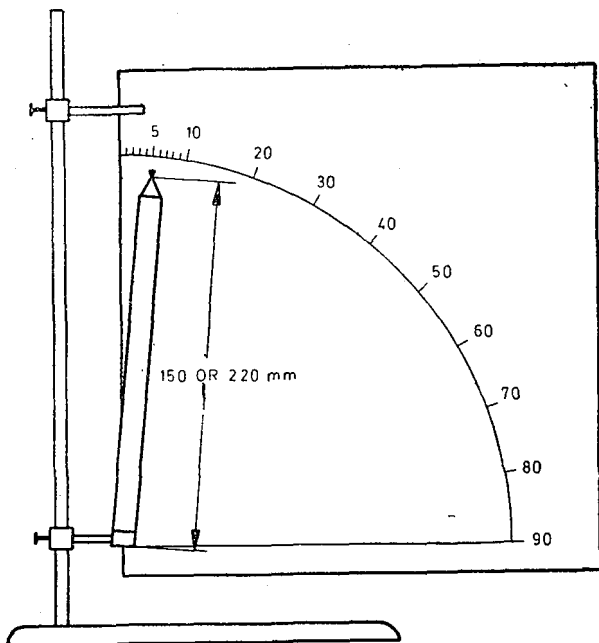


FIG. 5 DEFLECTION TESTER

C-1.2 Constant Temperature Cabinet — The constant temperature cabinet shall be large enough to hold the deflection test or assembly and shall be capable of maintaining a temperature of $35 \pm 1^\circ\text{C}$ (throughout the cabinet continuously for 24 hours).

C-2. PROCEDURE

C-2.1 The candle shall be placed in the deflection tester with the length of the candle 150 mm in the case of size 1 and 220 mm in the case of size 2 above the top of the clamp. The candle shall be at an angle at 5 degrees from the vertical, and so placed that an angular deflection of the specimen can be accurately noted on the protractor chart. The assembly shall be placed in the constant temperature cabinet maintained at $35 \pm 1^\circ\text{C}$. Allow to remain at this temperature for 24 hours with periodic observations for possible failure. Record angular deflection, the angular deflection shall be considered as the increase from the initial 5 degree position.

APPENDIX D

(*Clause 9*)

SAMPLING CRITERIA FOR CONFORMITY OF WAX CANDLES

D-1. LOT

D-1.1 In any consignment of the packets of wax candles of same dimensions produced under similar conditions out of same raw materials shall be grouped together to constitute a lot.

D-1.2 The number of packets to be selected from each lot shall depend upon the size of the lot and shall be in accordance with columns 1 and 2 of Table 2. More or less an equal number of wax candles shall be chosen from the selected packets to constitute a sample size as given in column 3 of Table 2.

D-1.2.1 These wax candles shall be selected at random from the lot and for this purpose procedures given in IS : 4905-1968* may be used.

*Methods for random sampling.

TABLE 2 SAMPLE SIZE AND CRITERIA FOR CONFORMITY

(Clause D-1.2)

LOT SIZE	SAMPLE SIZE		ACCEPTANCE No.
	No. of Packets	No. of Wax Candles	
(1)	(2)	(3)	(4)
Up to 15	2	5	0
16 „ 25	3	8	0
26 „ 50	5	13	1
51 „ 100	5	13	1
101 „ 150	8	20	2
151 „ 300	13	32	3
301 and above	13	32	5

D-2. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

D-2.1 The number of candles selected at random in accordance with column 3 of Table 2 shall be tested for mean horizontal luminous intensity, luminous efficiency, burning quality, duration of burning, breaking stress, drip, smoking, bending tendency and deflection in angular degrees as per test method given in Appendix A. The lot shall be considered as conforming to these requirements if the number of defective candles found in the sample is less than or equal to the corresponding permissible number of defective as given in col 4 of Table 2.

D-2.2 The lot shall be considered as conforming to the standard if **D-2.1** is satisfied.



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